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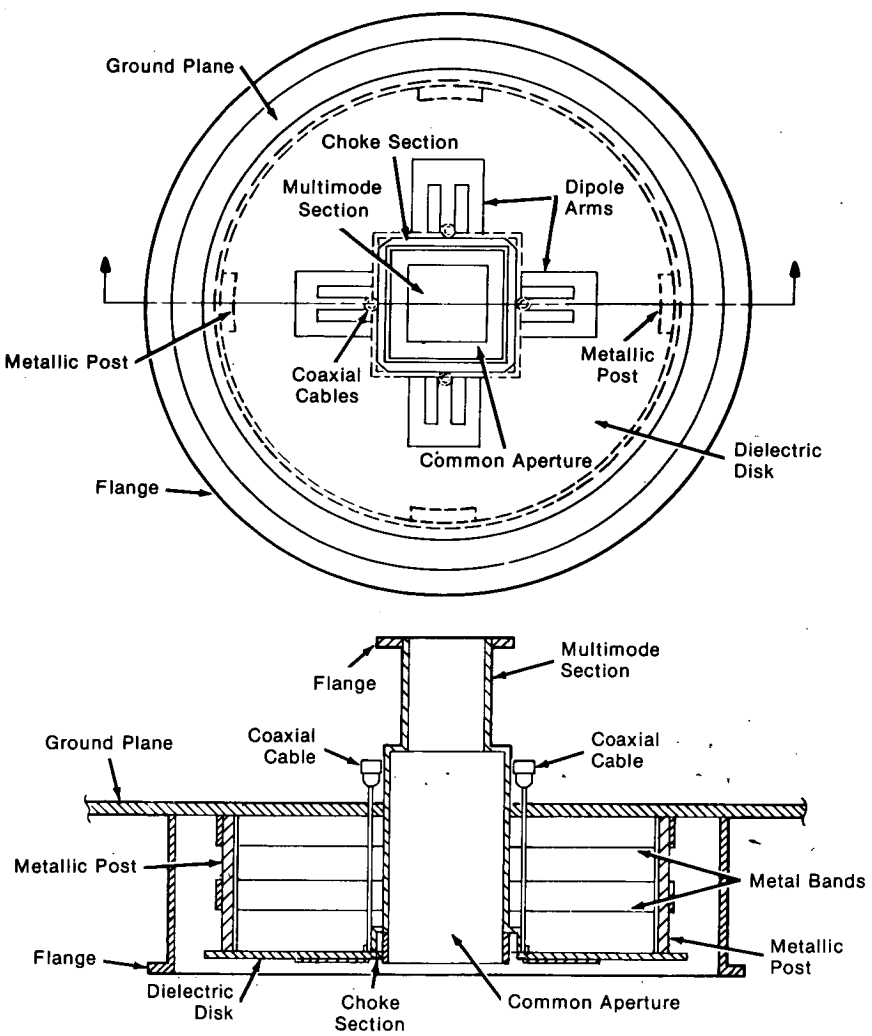
NASA TECH BRIEF

Goddard Space Flight Center

High-Efficiency Multifrequency Feed

The problem:

A telemetry antenna configuration operating on 1-GHz, 4-GHz, and 6-GHz bands simultaneously utilizes a multifrequency feed. Current multifrequency feeds, however, leave something to be desired. One design incorporating nested horns results in initial aperture blockage. The other design includes nested dipole clusters which produce mutual coupling effects. Each of these conditions reduces antenna efficiency.



Multifrequency Antenna Feed

(continued overleaf)

The solution:

Mutual blockage and mutual coupling are eliminated with a new multifrequency feed. The feed provides a common aperture for the 6-GHz and 4-GHz bands and a crossed dipole for the 1-GHz band. The design is highly efficient and has a good polarization diversity.

How it's done:

The multifrequency feed as shown in the illustration includes a horn with a square aperture. The horn provides a common aperture for the 6-GHz and 4-GHz bands. On the back side of the ground plane, the horn extends into a multimode step section which terminates with a flange. This section is dimensioned for the 6-GHz band. Surrounding the periphery of the horn at the lip is a quarter-wave choke section designed to inhibit the flow of a 4-GHz energy across to the 1-GHz dipoles.

Four uhf choked dipole arms are provided for the 1-GHz frequency band. Each arm is fed by a coaxial cable. The arms extend outward from the four sides of the horn so that a single dipole consists of two opposite arms and a central portion formed by the rim of the horn and fed at two points by the coaxial cables. They are supported by a dielectric disk. The disk in turn is supported by several metallic posts which are connected to the ground plane. A uhf cavity is formed by two metal bands surrounding the horn and the metallic posts that also support the bands. An open-ended metal cylinder attached to the ground plane surrounds the entire feed assembly. The cylinder is flanged to accommodate a radome, if desired.

Modern multimoding techniques are used to operate the feed. Multimoding is used for the 6-GHz frequency band to broaden the 6-GHz feed pattern to equal that of the 4-GHz band which is single moded. Mode exciters are coupled to the flange of the multimode section. The separation between the 4-GHz and 6-GHz bands is provided with conventional diplexers.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Code 207.1
Greenbelt, Maryland 20771
Reference: TSP74-10288

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,803,617). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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Categories: 02 (Electronics Systems)
01 (Electronics - Components and Circuitry)
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